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Unexamined Utility Model S63-164948

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(54) Name of Device: **Smoke absorbing device**

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## Specification

1. Name of Device  
Smoke absorbing device
2. Scope of Utility Model Registration Claims
  - (1) A smoke absorbing device for cigarette smoking wherein a dust collecting cell 12 consisting of a plurality of cylindrical precipitator electrodes 2 is placed inside a case 1 in which a passageway is formed, a needle-shaped discharge electrode 4 is disposed inside of the various precipitator electrodes 2, and the aforementioned dust collecting cell 12 is caused to be supported by the dust collecting cell support section 8 installed in case 1 through slots 14 between the precipitator electrode 2.

3. Detailed Description of the Device  
(Industrial Field of Application)

The present device is one that relates to a so-called smoke absorbing device that that will absorb and remove tobacco smoke generated during cigarette smoking, and more specifically, is one that relates to improvements in the performance of the affected smoke absorbing devices by using an electrical smoke absorbing method.

(Prior Art)

In the past, a variety of air purification devices have been used to remove tobacco smoke generated during cigarette smoking.

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However, because the object of these air purification devices was to cleanse all of the air inside the room that had been polluted by smoke, they have not been popular because they are too heavy and bulky to be placed right next to smokers.

And while there have been air purifiers whose object was to be used when a smoker placed it close to the body, conventional air purifiers have been unable to sufficiently remove primary smoke that a smoker exhales directly in large volumes, even if the secondary smoke generated from a cigarette they leave [in an ashtray] can be processed, because their smoke absorbing capacity was low.

Electrical smoke absorbing methods are a means to provide a smoke absorbing device that imparts an excellent smoke removing effect, but they require a special space that enlarges the surface distance in order to prevent short-circuits in the circuitry due to adhesion of the smoke in order to use higher voltages, and it has been difficult to make the smoke absorbing device compact.

Problem(s) that the Device is to Solve

An object of the present device is to solve the problems in the prior art

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that have been outlined above by providing a light and compact unit offering sufficient smoke removing effects in a safe smoke absorbing device for use by smokers.

**{Means of Solving the Problem}**

To solve the problems outlined above, the smoke absorber of the present device has been formed by placing a dust collecting cell 12 consisting of a plurality of cylindrical precipitator electrodes 2 inside a case 1 in which an air passageway is formed, disposing a needle-shaped discharge electrode 4 inside of the various precipitator electrodes 2, and supporting the aforementioned dust collecting cell 12 with the dust collecting cell support section 8 installed in case 1 through slots 14 between a precipitator electrode 2 and the near-by precipitator electrodes 2.

**(Operation of the Device)**

The smoke absorber of the present device is connected to a blower fan, high voltage is applied between discharge electrode 4 and precipitator electrode 2 by a high voltage power supply that is not shown in the drawings, and smoke particles are given a charge by the corona discharge of the discharge electrode 4 inside the precipitator electrodes 2 and are collected on its inner wall when cigarette smoke is blown in from the upwind side of the case 1 while being drawn in simultaneously by the blower fan.

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Although the air from which smoke particles have been removed is exhausted downwind through the opening sections at the bottom of the dust collecting electrodes 2, a minute volume of the particles that are not collected will adhere and accumulate on the inner walls of case 1 and the mounting element of the discharge electrode, where there is a significant electrical potential gradient to such an extent that the removal rate will not be 100%.

Smoke particles that have adhered and accumulated in this way reduce the insulation properties of the inner walls of case 1, but the dust collecting cell support section 8 that supports the dust collecting cell 12 has gaps 14 that run between them and the precipitator electrodes 2, and are attached to the case 1, so both the precipitator electrodes 2 and these gaps have the same electric potential, and the gaps 14 either have no electric potential gradient at all or have an electric potential gradient that is extremely small, so that there would be no adhesion or accumulation of smoke particles on the support section 8.

As a consequence, there is no accumulation of smoke particles extending from the support section 8 to the dust collecting cells 2, so there will be no electrical shorts between the discharge electrode 4 and the dust collecting cells 2.

(Embodiments)

Figure 1 is a lateral cross section view of a smoke absorbing device that is an embodiment of the present device of, and Figure 2 is a partial cross-section along the A-A line 8-8 in Figure 1. In addition, Figure 3 is a perspective view of the smoke absorbing device shown in Figure 1.

In these drawings, a dust collecting cell 12 made up of 4 pieces of cylindrical precipitator electrode 2 is placed inside a cylindrical case 1 in which a flow passageway is formed, and a discharge electrode 4 placed on the tip of the [opposing connection/contact] electrode 3 inside each of the precipitator electrodes 2.

Precipitator electrodes 2 surrounded by mounting holes 17 are placed in the center on the cylindrical precipitator electrode mounting plate 6 of the dust collecting cells 12, and the relative positions of each of the precipitator electrodes 2 are additionally maintained by precipitator electrode support plates 7.

Dust collection cell locking members 5 are placed on the dust collection cell support section 8 that is installed along the gaps running between the various precipitator electrodes 2 and attached to the case 1, and these members 5 are inserted into the holes 18 that are provided in the precipitator electrode support plate 7 and the mounting holes 17 provided in the precipitator electrode mounting plate 6 so that the dust collection cells 12 extend over the dust collection cell support section 8 and are installed coaxially to case 1.

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The individual opposing contact electrodes 3 are placed on the concentric plates of the discharge electrode mounting plates 19 that are installed in the case 1 on the downwind side of the precipitator electrode 2, and these discharge electrode mounting plates 19 are two plates that serve as redundant protection against short circuits by means of leak preventing members 10 and 11, which are concentric plates that make internal contact with case 1 on the upwind and downwind sides, and further along on the downwind side of these parts, a fan and blower are provided to induce a draft.

In this embodiment of a smoke absorbing device, the inner diameter of the case 1 is 60 mm, the inner diameter of the precipitator electrodes 2 is 20 mm. A high-voltage power supply (not shown) applies a voltage of 8.5 KV between the discharge electrodes 4 and the precipitator electrodes 2. At the same time a blower fan 13 induces a draft of 150/ per minute to draw cigarette smoke into the case 1, and all of the smoke collected by the precipitator electrodes 2 when the cigarette smoke is drawn into the case 1, resulting in a smoke removal rate of 99%.

Over a ten month period of use during smoking, there were absolutely no electrical shorts, and while there was an accumulation of tar on the inner walls of the case 1 resulting in a decrease in insulating properties, there was no buildup of tar observed on the dust collecting cell support section 8 in the gaps 14 between the precipitator electrodes 2, and the insulating resistance between the discharge electrodes and the precipitator electrodes, as well as between the precipitator electrodes and the inner walls of case 1, was fully maintained.

(Effects)

As described above, the smoke absorbing device of the present device does not diffuse cigarette smoke around the room in the way that prior art air purifiers do because the cigarette smoke is drawn directly in and the smoke is removed.

Moreover, the smoke absorbing device of the present device makes use of an electrical precipitating method, which consequently affords superior smoke removal performance, and can fully remove smoke not only from the secondary smoke stream, but from the primary smoke stream as well.

Furthermore, the smoke absorber device of the present device is constructed from a plurality of precipitator electrodes in the dust collecting cells, and the dust collecting cells are placed into the case with supporting sections that pass through the gaps between the precipitator electrodes, thereby protecting against short circuits in the high voltage circuits, so that short circuits such as those observed in prior art electrical dust collecting devices are prevented so that the unit does not require a special location, and is extremely light and compact, as well as being safe.

Therefore, the present device is one that solves the problems observed in prior art, is lightweight and compact, and imparts a sufficient smoke removal effect, and furthermore, in use over extended periods of time,



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provides a safe smoke absorbing device for the use of smokers in which short circuits will not occur.

4. Brief Description of the Drawings

Figure 1 shows a cross section view of an embodiment of the present utility model. Figure 2 shows a partial cross section view of Figure 1. Figure 3 is a perspective view of the embodiment shown in Figure 1.

- 1 Case
- 2 Precipitator electrode
- 3 Opposing contact electrode
- 4 Discharge electrode
- 5 Dust collection cell locking member
- 6 Dust collection mounting plate
- 7 Dust collection support plate
- 8 Dust collection cell support member
- 9 Metal mesh
- 10 Leak preventing member
- 11 Leak preventing member
- 12 Dust collection cell
- 13 Blower fan
- 14 Gap
- 15 Opening
- 16 Opening
- 17 Mounting hole
- 18 Hole

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- 19 Discharge electrode mounting plate
- 20 Positioning member

Applicant for Utility Model Registration: Ohno Research & Development Laboratories, Y. K.

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FIG. 1

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FIG. 2

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FIG. 3

[see source for diagram]

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⑩ 実用新案出願公開

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審査請求 未請求 (全 頁)

⑭ 考案の名称 吸煙器

⑮ 実 願 昭62-55480

⑯ 出 願 昭62(1987)4月13日

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## 明 細 書

## 1. 考案の名称

吸 煙 器

## 2. 実用新案登録請求の範囲

- (1) 流路を形成する筐体 1の内部に筒状集塵極 2の複数個より成る集塵セル12を設け、集塵極 2の各々の内部に針状放電極 4を配設し、集塵極 2の間の隙間14を通り筐体 1に取付けた集塵セル保持部材 8に前記集塵セル12を保持せしめたことを特徴とする喫煙用吸煙器。

## 3. 考案の詳細な説明

## 〔産業上の利用分野〕

本考案は喫煙時に発生するタバコの煙を吸引除去する所謂吸煙器に関するものであり、更に詳しくは電気集塵法を応用したかかる吸煙器における性能の改善に関するものである。

## 〔従来技術〕

従来、喫煙時に発生するタバコ煙を除去するために各種の空気清浄機が使用されていたが、

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これ等の空気清浄機は煙で汚染された室内の全空気を清浄化することを目的としているために喫煙者が身近かに置いて使用するには重量と寸法が大きすぎる嫌いがあった。

また喫煙者が身近かに置いて使用することを目的とした吸煙器もあったが、従来の吸煙器は除煙性能が低いために置きタバコから発生する副流煙は処理できても喫煙者が直接吐き出す量の多い主流煙を充分除去することができなかった。

電気集塵法は優れた除煙効果を発揮する吸煙器を提供する手段ではあるが高電圧を使用するために煙等の付着による回路の短絡を防ぐために縁面距離を大きくする等特別なスペースを要し、吸煙器をコンパクト化することが難しかった。

(考案が解決しようとする問題点)

本考案は従来の技術における前述の問題点を解決して、軽量コンパクトで充分な除煙効果を

発揮し、しかも長時間の使用においても回路の短絡を生ずることのない安全な喫煙者用の吸煙器を提供することを目的とするものである。

〔問題点を解決するための手段〕

前述の問題点を解決するために本考案の吸煙器は空気流路を形成する筐体 1 の内部に筒状集塵極 2 の複数個より成る集塵セル 12 を設け、集塵極 2 の各々の内部に針状放電極 4 を配設し、集塵極 2 と隣りの集塵極 2 の間の隙間 14 を通り筐体 1 に取付けた集塵セル保持部材 8 に前記集塵セル 12 を保持して形成されている。

〔作 用〕

本考案の吸煙器は喫煙に際して図示していない高電圧電源によって放電極 4 と集塵極 2 の間に高電圧を印加し、同時に送風機によって吸気しつつ筐体 1 の風上側からタバコ煙を吹き込むと煙粒子は集塵極 2 の内部で放電極 4 のコロナ放電によって帯電してその内壁に捕集される。



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煙粒子を除去された空気は集塵極 2 の風下側の開口部より排出されるが、除煙率が 100 % でない限り捕集されない微量の煙粒子が電位勾配の大きい筐体 1 の内壁や放電極の取付部等に付着堆積する。

この様にして付着堆積した煙粒子は筐体 1 の内壁の絶縁性を低下させるが、集塵セル 12 を保持している集塵セル保持部材 8 は集塵電極 2 間の隙間 14 を通って筐体 1 に取付けられており、前記隙間を形成する集塵極 2 はいずれも同電位であるから前記隙間 14 には電位勾配が存在しないか存在しても極く少ないのでこの様な隙間 14 における保持部材 8 には煙粒子の付着堆積が生じない。

従って前記煙粒子の堆積は保持部材 8 から集塵極 2 へ拡がってゆくことがないから放電極 4 と集塵極 2 間において放電回路が短絡することはない。

(実施例)

第1図は本考案の一実施例である吸煙器の側断面図であり、第2図は第1図A-A部における部分断面図である。また第3図は第1図に示した吸煙器の斜視図である。

これ等の図において流路を形成する円筒状の筐体1の内部には円筒状の集塵極2の4個より成る集塵セル12が設けられており、集塵極2の各々の内部には反接電極3の先端に設けた放電極4が配設されている。

集塵セル12は円板状の集塵極取付板6に、その中央部に設けた取付孔17を囲んで集塵極2を取付け、集塵極2の各々は更に集塵極保持板7によって相互の位置が保持されている。

それぞれの集塵極2間の隙間14を通って筐体1に取付けた集塵セル保持部材8には集塵セル禁止部材5が設けられ、該部材5を集塵極保持板7に設けた孔18と集塵極取付板6に設けた取付孔17に挿入することによって集塵セル12が集塵セル保持部材8を跨いで且つ筐体1と同軸に装着されている。

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反接電極 3のそれぞれは集塵極 2の風下側において筐体 1に取付けた同心円板状の放電極取付板 19に取付けられ、放電極取付板 19はその風上側と風下側において筐体 1に内接する 2枚の同心円板状のリーク防止部材 10, 11 によって短絡を二重に防止されており、これ等の更に風下側には吸気のための送風機が設けられている。

本実施例の吸煙器において筐体 1の内径を60mm、集塵極 2の内径を20mmとして図示していない高電圧電源によって放電極 4と集塵極 2間に6.5KVの電圧を印加し、同時に送風機 13によって毎分150ℓで吸気しつつ筐体 1にタバコ煙を吹き込むと、その全量を吸煙して集塵極 2に捕集し、このときの除煙率は99%であった。

また10ヶ月間にわたって喫煙時に使用したが短絡は全く生ぜず、筐体 1の内壁にはタールが付着して絶縁性が低下していたが集塵極 2の間の隙間 14における集塵セル保持部材 8にはタールの付着が見られず放電極と集塵極間及び集塵極と筐体 1の内壁間の絶縁抵抗は完全に維持さ

れていた。

〔効 果〕

以上説明した様に本考案の吸煙器はタバコ煙を直接吹き込んで除煙するものであるから従来の空気清浄機の様にタバコ煙を部屋中に拡散することがない。

また本考案の吸煙器は電気集塵法を採用しているので極めて除煙性に優れており、副流煙のみならず主流煙も充分除煙することができる。

更に本考案の吸煙器は集塵セルを複数の筒状集塵極によって構成し、集塵極間の隙間を通して筐体に取り付けた保持部材に集塵セルを保持して高電圧回路の短絡を防止しており、従来の電気集塵装置の様に短絡防止のために特別なスペースを要しないから極めて軽量コンパクトで且つ完全である。

よって本考案は従来の技術における問題点を解決して、軽量コンパクトで充分な除煙効果を発揮し、しかも長時間の使用においても回路の

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短絡を生ずることのない安全な喫煙者用の吸煙器を提供するものである。

### 4. 図面の簡単な説明

第1図は本考案の一実施例の側断面図であり、第2図は第1図の部分横断面図である。

第3図は第1図に示した実施例の斜視図である。

- |                  |                  |
|------------------|------------------|
| 1 . . . 外筐       | 2 . . . 集塵極      |
| 3 . . . 反接電極     | 4 . . . 放電極      |
| 5 . . . 集塵セル禁止部材 |                  |
| 6 . . . 集塵極取付板   |                  |
| 7 . . . 集塵極保持板   |                  |
| 8 . . . 集塵セル保持部材 |                  |
| 9 . . . 金網       | 10 . . . リーク防止部材 |
| 11 . . . リーク防止部材 |                  |
| 12 . . . 集塵セル    |                  |
| 13 . . . 送風機     | 14 . . . 隙間      |
| 15 . . . 開口部     | 16 . . . 開口部     |
| 17 . . . 取付孔     | 18 . . . 孔       |

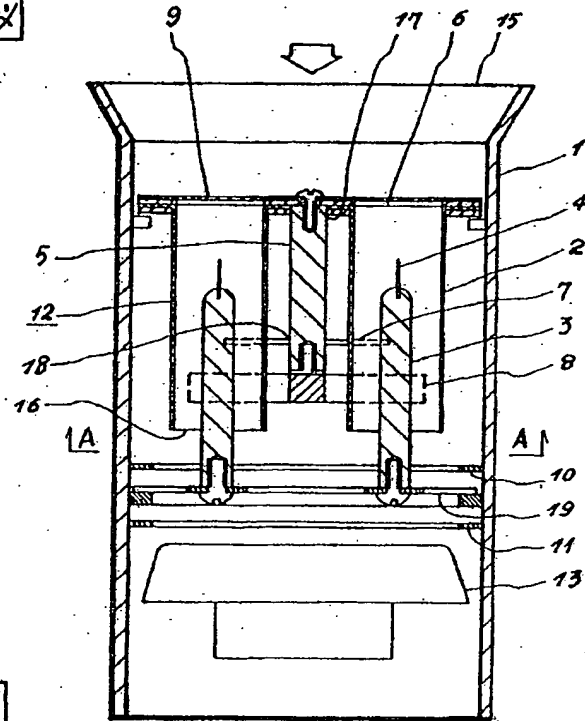
19 . . . 放電極取付板

20 . . . 位置決め部材

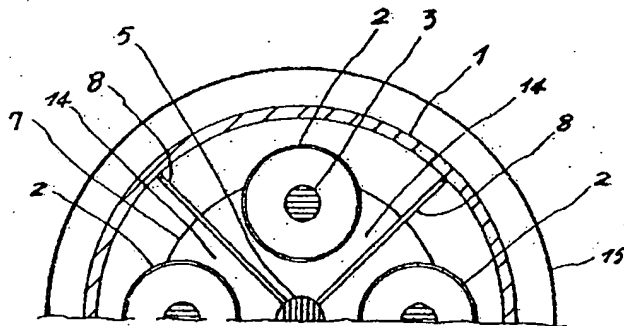
実用新案登録出願人 有限会社 大野技術研究所

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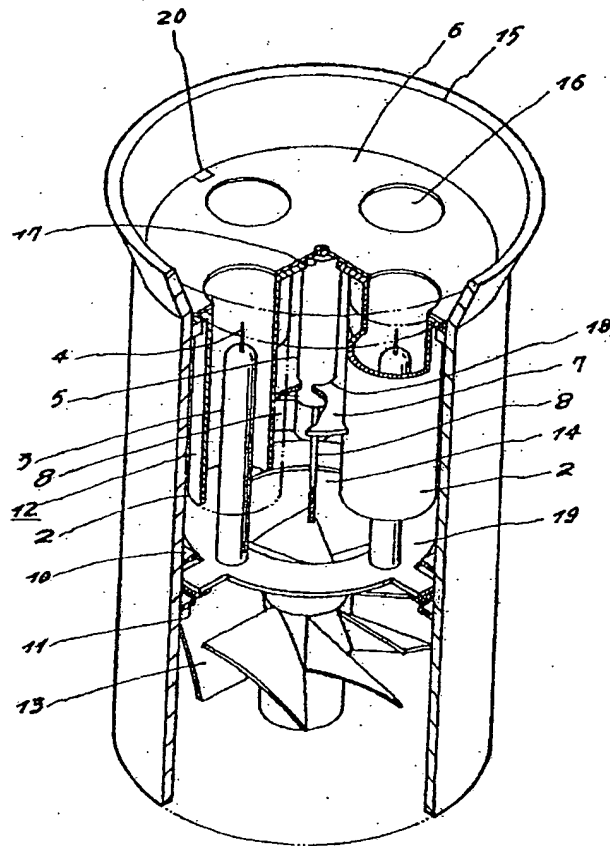
第1図



第2図



## 第3図





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